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The Role of Classification in Subject Retrieval in the Future

It always seems befitting that the last speaker at a conference should gaze at a crystal ball and predict the future of the subject that has been discussed; I feel I should quote Confucius by saying that I do not invent, but transmit.

In the last ten years, since the Elsinore Conference on Classification Research, classification theory and practice have produced a large body of literature and contributed to meetings such as this one. Major futuristic works, especially *Classification in the 1970's,*[1] which was published early in this decade, provide the reader with a clear insight of what the future holds for each topic covered. J. Mills states of Bliss's *Bibliographic Classification* that "as a library classification scheme *per se,* the prospect is clear and bright," but "from the point of view of its future use, the prospect is less predictable."[2] Bibliographic Classification (BC) is being revised because some ninety libraries use it and need a revised edition. Presently, no BC class numbers are provided from centralized cataloging services such as *British National Bibliography*, MARC tapes, etc. However, Mills asserts that if demand warrants it: "This might involve the development of a 'switching language' whereby the subject analysis and description implicit in the production of PRECIS index entries . . . could be translated quickly and economically into BC numbers."[3]

Gopinath writes that the third version of the Colon Classification (CC) is tending to become a freely faceted analytico-synthetic scheme:

> It is now possible for the notational system of CC to place any new main subject, or non-main subject–simple or compound in any facet–in the helpful position determined by the idea plane.... Thus during the next decade the development of CC will be approximate to the ideal of a freely-faceted model of classification.[4]

According to Sarah Vann, the flexibility of notation in Dewey's Decimal Classification (DDC) will contribute to its internationalization:

> This flexibility is to be 'controlled' through the inclusion of notes telling where to class subjects displaced. How long the 'official' Dewey will remain official in use, therefore, is highly speculative until further study is made. It can be assumed, however, that the use of the basic text both by the *British national bibliography* and the Decimal Classification division of the Library of Congress will continue to insure authoritative interpretation of notation.[5]

This prompts me to question the desirability and the practical value of a truly international scheme; varied cultures, national differences, distinct systems of values (even among countries in the Western world) have already shown that DDC is inadequate in some areas, namely the 100s, 200s, and 300s.

J.P. Immroth has invested a lot of energy, thought and research on the Library of Congress Classification (LCC).[6] He deserves credit, I believe, for the first groundwork in building a theoretical approach to LCC, (fragile as it may be). I feel that the future of this scheme lies in its keeping up with the development of knowledge in its own enumerative manner and not in trying to imitate other schemes. The wealth of words contained in the schedules, the indexes to the schedules, and the lists of subject headings should allow for further research on the homologation and structural model building of the scheme and its ancillaries.

The Universal Decimal Classification (UDC) development program for the 1970s has been described by G.A. Lloyd.[7] Funded partly by the International Federation for Documentation (FID) and partly through UNESCO, the program may be considered in four phrases, in addition to the normal revisions. They are:

1) immediate elaboration of a UDC "roof scheme" capable of fulfilling the role of international switching language in multilingual and multidisciplinary information systems, especially of an international or large-scale nature;
2) extended studies on the use of UDC combined with coordinate-indexing schemes, thesauri or special-subject classifications, and the

compilation of appropriate concordances, as means to improving information retrieval systems generally;

3) short-term priority projects, mainly FID-funded, to improve or remedy defective or deficient parts of the existing UDC schedules;
4) further perspectives of structural and notational improvements of a more far-reaching nature.[8]

Although Vickery's paper on classificatory principles in natural-language indexing systems[9] presents a sound explanation of the underlying classificatory technique in indexing, no new ventures in this particular area are foreseen.

In his paper, "Prospects for Classification Suggested by Evaluation Tests Carried Out 1957-1970," E.M. Keen questions the benefits of classificatory index languages on the ground that their logical foundations may be at fault.

> In providing controlled languages their artificiality and complexity introduce new opportunities for misunderstanding and error. But another answer may be that the logical foundation presupposes a false view of the objectives of document retrieval systems. Users rarely require to see every single fully and marginally relevant document in a particular file, and they do not always expect that every non-relevant document in the file can be withheld.[10]

He concludes that the next decade will see different kinds of information retrieval systems—manual, mechanized and new ones approaching automation. Keen deduces:

> On considerations of retrieval performance there is ample evidence that, in the kind of situations covered by tests so far, relatively uncontrolled languages used at the indexing stage cannot be improved on by controlled languages, and that in many cases even the use of controlled language aids at the search stage will not be necessary.[11]

For the sake of thoroughness, I will summarize Derek Austin's viewpoints as presented in his paper on trends toward a compatible general system.[12] In this paper, he has outlined and discussed postulates and findings of the Classification Research Group as they relate to that group's approach to classification. Plans for research into a new general classification scheme were laid down at the London Conference in 1963.[13] Throughout the years, the plans have evolved from a fairly conventional faceted classification scheme to the assignment of concepts "in a once-and-for-all basis to general categories from which they can be selected as needed in the building of any compound subject."[14]

PRECIS, as Austin writes, "should be seen rather as an interesting by-product of the continuing search for a general classification scheme."[15] Its strings have been rotated to produce sets of entries that are meaningful in languages other than English. Recent developments in linguistics (namely Chomsky's school) have contributed to classification research insofar as it "supports the hypothesis of a deep syntactic structure which is common to all language systems."[16] Therefore, the goal of the CRG research is to produce a "metalanguage which is capable of expressing any subject as a string of notated elements which is neutral with respect to: (a) the placing of the subject in various standard shelf order classifications, (b) the categorial framework of the user of the system, and (c) the words and syntax of any one natural language."[17]

Robert Freeman concludes his discussion of "Classification in Computer-Based Information Systems of the 1970's" with the statement:

> The matter of switching among existing classifications and indexing languages used in machine-readable data bases probably will continue to be subject of considerable effort throughout the 1970's. A variety of classifications will continue to thrive in the context of computer-based systems, both as file-partitioning and as detailed subject searching devices. Large-scale use of automatic classification techniques is probably at least a decade away.[18]

We are so close in time to these projections that I find it difficult to assess them. Since no single classification scheme or indexing system can take care of all library situations satisfactorily, the development and improvement of what seem to be competing systems will be with us for some time.

Maltby wrote that "there are a number of fundamental questions which profoundly concern the future of classification in general libraries, particularly if by the term 'classification' we really mean a rational sequence of the maximum utility and not simply a convenient pigeonholing system." He believes that "there is an increasing gulf between the type of classification needed for book arrangement and that required for information retrieval."[19] This quotation points to the lack of rigorous usage of terms in librarians' professional jargon. We have often used interchangeably the terms *informational retrieval* and *subject retrieval*, treating them as synonyms or near-synonyms. This has given rise to much confusion in teaching classification as well as in applied classification. Many fine minds have formulated their own definitions using one term and ignoring the other one, or using the two terms synonomously. I believe that as librarians, we should be reminded of Henri Bergson's warning: "On est libre de donner aux mots le sens qu'on veut, quand on prend soin de le définir."[20]

John Metcalfe concludes an article entitled "When is a Subject Not a Subject?" with the statement that "'subject' has not proved a satisfactory term in information retrieval because of ambiguity in its use in information at large."[21] The term is nevertheless here to stay in communication with library users, but generates confusions in meaning with distinctions between the general and the specific, and between object and aspect. "Isolate has had some use to distinguish one of its meanings, but not without ambiguity of what Kaiser called Concrete and Process and what Cutter with more certain breadth of meaning called object and aspect."[22] For himself, Metcalfe intends to continue the distinction between object and aspect. By doing so, he endorses dialectical epistemology: the knowing subject and the known object–aspect, as he uses it, being a restriction at a conscious level of what we want to know about the object. This can be applied to the daily library environment as information retrieval from a subject-matter embodied in a document. I believe that most library classifications have succeeded to some extent in providing subject retrieval by mapping out or listing subjects, but many failed, save those that have introduced facet analysis or similar devices, to produce information retrieval from subjects. The editors of the *Dewey Decimal Classification* made an interesting and necessary distinction between *subject* and *discipline* as a useful device in applying that particular classification scheme. In that case, *subject* would be equivalent to *concept,* and *discipline* would fit the concept in such *a priori* classification schedules.

Robert Fairthorne writes: "The problem of helping those who are ignorant, in detail, of what people have said about things, is therefore solved by defining 'aboutness' in extension. That is by listing the things that are mentioned in a document. . . ."[23] But the mere listing of things or entities does not reveal what is said about them, because it is irrelevant to the reader who is necessarily ignorant of what is said. Fairthorne distinguishes two kinds of "aboutnesses": (1) extensional "aboutness" takes into account the environment of the use and the production of a document (thus it is a relation, not an attribute); and (2) intentional "aboutness," which clearly cannot be determined from the study of the text alone: "It entails knowledge of how it is going to be used by what class of readers."[24] While not applying entirely William James's pragmatism to library classification, this last quotation from Fairthorne is suggestive not only of a classification of knowledge or the determination of the "aboutness" of a document, but also of a classification of readers. Shera stressed that "the study of *habits of use* is requisite to the act of classifying," for "there can be no universal library classification because there is no universal library user."[25]

The term *user habits* is a catchall to cover the behavior of all kinds of readers, from pre-readers to scholarly users. We must know more about our readers as individuals seeking information and recreation; we must know more

about them as members of a socioeconomic group; we must know more about the civilization or culture to which they belong, and about the values which they cherish. It would be a gross error to overlook differences among peoples and nations even in the Western world; too often library classifications have been forced upon certain groups of readers, making the use of classification as an effective information retrieval tool almost impossible to achieve.

The use of classifications for retrieval is not an invention of modern Western man; primitive peoples have through the ages devised taxonomies and classifications for their own benefit. These were by no means mere intellectual exercises, but were implements for their survival, both physical and spiritual.

Many distinguished ethnologists have collected and interpreted primitive peoples' classifications, but none has given so much attention to their theories as the great French philosopher and anthropologist Claude Lévi-Strauss. He synthesizes the examination both of the structure of primitive thought and of the complexity of the organization of primitive collective life. In his book, *The Savage Mind,*[26] Lévi-Strauss deals extensively with classifications of primitive peoples. At first glance, languages of American Indians and other primitive peoples include few terms to express concepts; lacking words like *tree* or *animal,* their classifications are, as a rule, very detailed and enumerative. Krause claims that Indians classify and name living organisms in two main categories: useful and harmful.[27] Anything that does not fall under one of these two categories makes up a third category which we could consider neutral. The study of languages will reveal that names are assigned to things according to the particular needs of each community.

The theoretical foundations of totemic classifications, if we may be allowed to use this term, are quite simple: classifications are devised to bring order into the universe. According to Lévi-Strauss, "classifying, as opposed to not classifying, has a value of its own, whatever form the classification may take."[28] Classification is based on observation leading to a systematic inventory of relations and connections that leads, sometimes, to correct scientific results. One interesting example is classification by smell; modern chemistry has revealed that the presence or absence of carbon, hydrogen, oxygen, sulfur, and/or nitrogen will affect smell and taste. Botany separates onions, garlic, cabbage, turnips, radishes, and mustard (some belonging to the *liliaceae* and others to crucifers), but the olfactory sense confirms that these plants all share one element, sulfur. Simpson has stated that the demand for organization is a need common to art and science and, in consequence, "taxonomy, which is ordering par excellence, has eminent aesthetic value."[29]

Any classification is superior to chaos, even when it is based on external and artificial characteristics; it is a step toward rational ordering and is a tool that makes the building of a memory possible.

Among American Indians, the Navaho, who claim to be great classifiers, have divided living beings into two categories: those endowed with speech and those that are not; the latter includes animals and plants. Animals are then divided into three groups: running, flying, and crawling.[30] These species are a far cry from Western zoological taxonomies. Reichard writes that, "since the Navaho regard all parts of the universe as essential to well-being, a major problem of religious study is the classification of natural objects, a subject that demands careful taxonomical attention."[31] Of the Guarani of Argentina and Paraguay, Dennler states:

> In general, native terms can be said to constitute a well-conceived system, and, with a pinch of salt, they can be said to bear some resemblance to our scientific nomenclature. These primitive Indians did not leave the naming of natural phenomena to chance. They assembled tribal councils to decide which terms best corresponded to the nature of species, classifying groups and sub-groups with great precision. The preservation of the indigenous terms for the local fauna is not just a matter of piety and integrity; it is a duty to science.[32]

Lévi-Strauss regrets that ethnologists disregard these classifications by concluding that they were of no value whatsoever for the study of primitive peoples. He finds that these classifications bear a close resemblance to those devised in ancient times and in the Middle Ages by such men as Galen, Pliny, Hermes Tresmegistus, and Albert the Great, and are very close to Greek and Roman plant emblematism.[33]

The study of totemic classifications is fascinating; characteristics of such classifications are quite different from one culture to another. Lévi-Strauss states that: "The terms never have any intrinsic significance. Their meaning is one of 'position'—a function of the history and cultural context on the one hand and of the structural system in which they are called upon to appear on the other."[34] They are built on dichotomies based on values and usefulness and are hierarchical. "The truth of the matter," writes Lévi-Strauss, "is that *the principle underlying a classification can never be postulated in advance.* It can only be discovered *a posteriori* by ethnographic investigation, that is, by experience."[35]

It would be tempting to conclude that totemic classifications are mere listings used to build a collective memory, but relationships between terms make them workable. These relations are most commonly based on contiguity or on resemblance. Formally, contiguity and resemblance play an important part in modern classifications of knowledge; as Lévi-Strauss says in regard to Simpson's remarks:

> contiguity for discovering things which "belong both structurally and functionally . . . to a single system" and resemblance, which does not

> require membership of the same system and is based simply on the possession by objects of one or more common characteristics, such as all being "yellow or all smooth, or all with wings or all ten feet high."[36]

Other kinds of relationships may be found on either the sensible level or the intelligible level. Relations will vary from one culture to another; in fact, these civilizations could be labeled richer or poorer "on the basis of the formal properties of the systems of reference to which they appeal in the construction of their classifications."[37] The totemic classifications are not only conceptualized, but lived. By pointing out some aspects of Lévi-Strauss's work on totemic classifications, I am not suggesting that we should avail ourselves of primitive classifications, but that we might draw from these "savage minds" their concern for usefulness, both physical and spiritual, relevant to our late-twentieth-century, post-industrial society.

We are now familiar with Piaget, Bärbel and Inhelder's findings on classification or, more precisely, on classifying. In a contribution to the Shera Festschrift entitled "The Contribution of Classification to a Theory of Librarianship," D. J. Foskett summarizes the Geneva school's findings on classification. There are two ways of forming a class: (1) by analysis (or the separation) of things from a collection by naming their specific properties, and (2) by synthesis (or the grouping) of things which share certain properties. It is clear that separating and grouping can be done on the basis of more than one property or set of properties: "Thus the processes of forming concepts involve multiplicative classifications, or lattices, and not just single hierarchies. Mastery of these processes brings the ability not only to form classes, but also to identify the relations between objects that exist in the real, material world."[38]

The problem of relations, even though Farradane[39] hoped to have solved it twenty years ago, is still very much with us. The PRECIS system's relational operators are effective inasmuch as they are used with that method of indexing, but would they be as effective in another classificatory and/or indexing environment?

In a recent article on the future of classification, Phyllis Richmond wrote: "We do not yet have an organizing philosophic basis for current thought in the late twentieth century. The philosophy may be here but unrecognized, or it may be in process but has not yet emerged publicly."[40] She regrets that the Classification Research Group has no philosophical system for the projected New General Classification. They give their attention to Francis Bacon's Reason only, leaving aside for the time being, we hope, Memory and Imagination.[41] The future of classification in subject retrieval may lie not only in developing a philosophical basis, but also in determining

in which way the different fields of knowledge are interrelated by deciphering the structures of knowledge that comprise knowledge itself.

In a remarkable book edited by Jean Piaget, *Logique et connaissance scientifique*,[42] Piaget rejects what he calls static classifications, which he considers artificial. The problem is to find epistemological filiations and analogies between different forms of scientific knowledge, and the epistemological meaning of these relations, as classification is considered as a search for noetic filiations.

Piaget posits that the dependency relation among the sciences necessarily leads to a linear classification. In reviewing some classifications from Bacon to Kedrov, he finds that according to Spencer's empirical epistemology, knowledge comes from the object itself, the forms of the object or phenomena. Knowledge concerning itself with forms only will produce a linear series, where the first term will be the most abstract and the last the most concrete. Spencer seems unaware that the abstract can be drawn not only from the object, but also from the actions of the subject.

Piaget recalls that an epistemology is a kind of a dialectical situation between a subject and an object. The object is known only through the subject and the latter knows itself in relation to the object. The setting of the foundations of logic and mathematics must therefore lie with the subject, and the building of a science of the subject requires biology, physics and mathematics. Auguste Comte's intent was to set a linear classification, but epistemologically his system suggests circularity. Relations between genesis and structures are the main problems to be faced in establishing a classification scheme. Are structures a result of a genesis? If so, how do we explain genesis without referring to structures? The first link contains the axiomatic sciences, and the last contains sciences of genesis (or as Comte calls them, *dynamiques*).

Cournot had divided knowledge according to structures and genesis. Disregarding Bacon's human faculties, his classification goes from the least historical—mathematics—to the most historical—the humanities. He also introduced a third dimension: the technical or practical series.

The latest classification of the sciences has been elaborated by the Soviet epistemologist, B. Kedrov. Kedrov rejects what Piaget calls static classifications, where a continuity is provided from one science to the other, and he also rejects classifications based on usefulness. Kedrov starts with what he calls the principles of objectivity and of subordination (or development from inferior forms to superior forms). One must consider primarily Kedrov's dialectics as a methodology, not as a philosophy. If one considers dialectics as a methodology stemming from the humanities, or more exactly from psychology and sociology, the method can go back to the starting point of logic/mathematics to provide structures for the physical sciences and to

I.	Logic/mathematics
II.	Physical sciences
III.	Biological sciences
IV.	Psycho-sociological sciences
A.	Domaine matériel (material scope)
B.	Domaine conceptuel (conceptual scope)
C.	Domaine épistémologique interne (internal epistemological scope)
D.	Domaine épistémologique dérivé (derived epistemological scope)

Table 1. Piaget's Epistemological Levels.

contribute to a total circular system of the sciences. The problem is not one of a structure to be given to a classification of the sciences (classifiers and classificationists cannot modify the real world); the problem is rather whether the sciences, in their spontaneous evolution, will reveal linear and hierarchical structures or cyclic and interdependent structures. Is knowledge developing as a living organism where all organs are interconnected, or is it developing by subordination in a preferred field?

Piaget has worked for more than thirty years on his proposed system of classification. His hypothesis is that the system of the sciences bears a circular structure, not a linear structure. He divides knowledge into four broad classes: I. logic/mathematics; II. physical sciences; III. biological sciences; IV. psycho-sociological sciences, including linguistics, economics, etc. (see Table 1).

At first glance, the proper order would appear to be I, II, III, IV, with a possibility of an internal interaction between IV and II, and I and III, discarding, therefore, a I to IV fixed sequence ending at IV. This is not an arbitrary order; there are relations between the classes. The meaning and the nature of these relations must be defined, for it would otherwise be totally absurd to link mathematics to psychology: while the latter relies on experimentation, the first relies on deduction. Piaget develops the hypothesis of the circle of the sciences by distinguishing different kinds of dependence: "reduction" or filiation between the sciences.

A first distinction must be recognized before establishing relations between different fields of knowledge and the use of these relations to build a natural classification (*natural* meaning here "adapted to the nature of these relations without any reference to the distinction between nature in general and ideal or transcendental realities").

The distinction lies between the *domaine matériel*—the material scope or matter of a science, i.e., the set of objects with which it concerns itself (for example, numbers and functions for mathematics; bodies, energies and organs for physics and biology) and the *domaine conceptuel*—the conceptual scope or

set of theories or organized knowledge of a particular science about its object (for instance, the theory of numbers, the theories of masses and energies, the description and interpretation of biological organs, the analysis of mental phenomena). The material scope will be labeled IA, IIA, IIIA, IVA; and the conceptual scope IB, IIB, IIIB, IVB. It is perfectly acceptable to relate the material scope of IA *logic mathematics* and IVA *psycho-sociology;* this has been done by empiricists who have "reduced" logic/mathematics to language; Piaget, however, derives them from the general coordinations of action.

On the other hand, it would be rather clumsy to relate the conceptual scope of IB *logic/mathematics* to IVB *psycho-sociology;* the mathematician does not consult a psychologist before formulating a theory of numbers or complex functions. It is therefore possible to draw a circular classification at the level of material scope, but the conceptual scope remains linear. It is worth noting that classificationists have more or less taken this dichotomy into account when devising their systems. When Comte discards psychology and inserts its object in biology and sociology, he deals with the material scope. The observations, theories and experiments belonging to the conceptual scope are not altered whether psychology is classed in biology or sociology.

One might say that most classifications are concerned with the *material scope* exclusively. However, knowledge about a science is not developed on one level only; different levels of knowledge proceed from the conceptualization (B) of its object (A) to an inquiry into that conceptualization, which in turn leads to a critical examination, or to the internal epistemological scope. This third level will be assigned the letter C and is defined as the set of theories whose objectives are the criticism or the study of the foundations of the conceptual scope. The four main classes of this level will thus be: IC, IIC, IIIC, and IVC.

The study of the foundations of a science will eventually yield general epistemological problems such as the part of the subject and the contribution of the object to knowledge. A fourth level, D, *derived epistemological scope,* will accommodate the general epistemological results of comparing one science with other sciences. The problem will then deal with relations between the subject and the object. It is therefore essential that this level—ID, IID, IIID, IVD—be considered separately, because IVD concerns itself with psychogenesis and sociogenesis, and thus constitutes an indispensable part of genetic psychology. Obviously, epistemologies C and D refer equally to the material scope A and to the conceptual scope B, because their concern is the critical examination of concepts B in relation to their object A. Classifications according to B and C will remain linear, whereas a cyclic structure will be found in A and D, since the study of the subject in the building of the logico/mathematical structures is already an object in IVD.

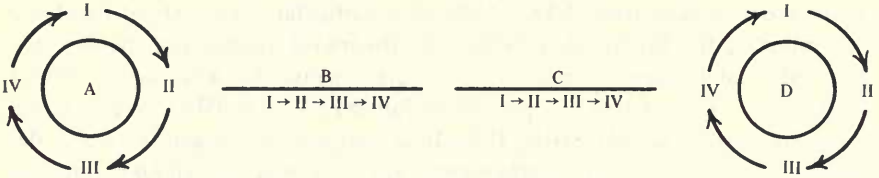

Figure 1. Piaget's Circle of the Sciences.

Piaget concludes that a dynamic classification of the sciences takes into account the four levels of knowledge because they are interdependent. He then exhibits the relations between the subject and the object. Relations of succession may differ according to the levels considered: for levels A and D the order appears circular, while for B and C it appears linear. On the hypothesis of a circular order of the sciences, Piaget distinguishes two kinds of relations: causal and implicative. The causal relations belong to the physical and biological sciences—to their material object. On the other hand, mental states such as feelings, values, and obligations are not causes, but imply something; we call them, therefore, implicative relations. If the circle of the subject and the object produces a cyclic structure to the whole of the sciences, it is because there is a dialectic or circular relation between classification systems based on causality and those based on implication.

Having defined these types of relations, Piaget distinguishes six types of dependence. These are: (1) unilateral reduction of a science or causal theory to another; (2) reduction by interdependence of sciences or causal theories; (3) correspondence between a causal system and an implicative system until the first is assimilated by the second; (4) correspondence between a causal system and an implicative system, with a search towards an isomorphism or a structure; (5) interdependence by abstraction between two implicative systems; and (6) reduction by axiomatization of two implicative systems.

Piaget's basic concept of the relations among the sciences can be expressed by the drawing of a circle: it takes its origin in logic/mathematics and closes also in logic/mathematics. He concludes that the material scope (A) is circular, given the fifth and sixth types of dependence, where logic belongs equally to levels A and D. The conceptual scope (B) is linear; logic tends to consider all circles as vicious. The internal epistemological scope (C) is linear, for approximately the same reasons as were applicable for B. Finally, the derived epistemological scope (D) is circular. Piaget grants that the limits between C and D might be somewhat difficult to determine. The epistemological results obtained in C in a given science may prove valid in another science. The circularity of A and D remains hypothetical until the

types of dependence have been set and proved to exist. The proof of the circularity of both A and D is obtained by the application of Piaget's dialectical epistemology: the subject knows the object through his own action performed on the object, and knows itself insofar as it is affected by the object. Empiristic philosophy draws knowledge from the object alone; aprioristic philosophy from the subject alone.

I am very much aware that Piaget's circular classification might be indeed difficult to apply to a practical library and information-oriented environment, but I believe it is worth investigating. Regarding knowledge per se, his system has set its own limitations; it does not provide for knowledge that is not scientific, such as practical knowledge, beliefs, opinions, values, and what Erikson calls "intimacy with the domain," which includes knowledge acquired by connoisseurs of the fine arts and music, sports fans, serious collectors, etc.

These considerations, some far-fetched, should not deter us from trying to cope with the more mundane, day-to-day problems that we face in libraries. Among these problems is the "tandem"—close *vs.* broad classification exists only in library situations where the classification scheme serves two purposes: shelf location and subject analysis (in its broadest meaning). Theoretically, there is no physical limit to minute classification in catalogs, whether manual or automated. But if the classification scheme selected serves as a location device, truncation is possible without more or less loss of meaning if the notation is hierarchically expressive—whatever applies to the whole applies to the parts. I cannot imagine truncation applied to other types of notations that do not express hierarchy without severe loss of meaning.

In November 1973, the Library and Learning Resources Service of the City of London Polytechnic conducted a survey in which problems on automation brought questions on the length of DDC-18 class numbers as allocated by the *British National Bibliography* (BNB). In this survey, it was decided to investigate the possibility of truncating numbers in a select group of classes which reflect the collections held by that particular institution, without too much loss of information. Results of the study indicated that:

> Specificity of classing is a principle well established in texts on classification and in practical classification as carried out by LC and BNB. Truncating numbers either on a rigid basis of *X* digits after the decimal point or using the prime marks as suggested in the DC 18 Editor's Introduction (vol. 1, p. 41) inevitably reduces specificity and merges topics.[43]

The surveyors found that one of the features of class 300 and especially 330, 380 and 350 were long numbers resulting from additions from the Area Tables and the use of "add as" instructions, particularly in 300 and 380. They

also felt that: "the 5- and 7-digit levels are unacceptable and that if truncation is to take place it should be at the 9-digit level. . . . If we take into account the fact that class numbers are not always coextensive with the subject matter, then the true picture is even worse."[44]

The surveyors recommended that more research is needed to determine the relative costs of:

1. The extra staff and user effort in searching a non specific catalog and shelves.
2. The extent to which users do not find a book because of long class numbers (unable to memorize or writing it down wrongly).
3. The extent to which users are put off from using the catalogue.
4. The difference in staff tidying and shelving times.[45]

The results of such an investigation would apply exclusively to a library environment where the three following conditions would be met: (1) open shelves, (2) classification is used for shelf location and subject analysis (in its broadest meaning), and (3) the scheme used is DDC or another scheme whose notation is decimal or lends itself to truncation without loss of meaning. It would also entail reassessment of the research and educational value of open stacks, self-service, and browsing.

Maltby has stated that: "there is an increasing gulf between the type of classification needed for book arrangement and that required for information retrieval. . . . The dichotomy is now too certain for any one scheme to be viewed with confidence as a classification for all situations."[46] He writes further that: "Broad classification, apart from the effect on cataloguing and the uncertainty of interpretation as to just what constitutes 'broad shelf arrangement; is at best often little more than a ruined shell of the scheme represented."[47]

The classified catalog is not theoretically bound to an exact matching of class numbers on books and catalog cards. In libraries maintaining this kind of catalog, the books may be arranged on the shelves in any orderly fashion; it may be by accession number, it may be by a classification scheme totally different from the one selected for the catalog, or according to the classification scheme used in the catalog, matching exactly the principal class number assigned to the catalog, or a broader class number than the one selected as the principal number for the catalog.

It is not within the scope of this paper to analyze the components of the classified catalog, nor its virtues and weaknesses; eminent librarians such as Shera and Egan,[48] Ranganathan,[49] and R. F. Kennedy[50] have treated with great intellectual rigor this tool for subject retrieval. I will, however, comment briefly on the few remaining or recently closed classified catalogs on this continent.

Among the most important classified catalogs recently closed are those of the Boston University Library and the National Library of Canada. Each of these catalogs was constructed quite differently: the Boston University catalog was a far cry from the rules on the construction of a classified catalog as set forth by Shera and Egan and by Ranganathan; LCC class numbers were used in the classified list, and LC subject headings were used for the index, matching as far as possible the class numbers assigned to the classified file.[51]

The National Library of Canada catalog was begun in 1961 and closed in 1974. It was "arranged in Dewey Decimal Classification order [with] indexes in English and French established according to the technique of chain indexing."[52] LCC class numbers were assigned to books.

According to Margaret Hazen, the Boston University Library catalog "had a serious drawback—namely, the difficulty of keeping the subject records current,"[53] resulting in a serious backlog. The development of LC MARC tapes and "the introduction of cooperative cataloging by member libraries in the OCLC [Ohio College Library Center] system provided a possible method for achieving speed and efficiency in subject—and general—cataloging."[54] Boston University became a member of the New England Library Network, accepting LC call numbers and subject headings, and began an alphabetic subject catalog. Standardization is the main reason behind the abandonment of the classified catalog. The same reason prevailed in the closing of the National Library of Canada catalog:

> The decision was made because of the need for greater standardization and the ensuing possibility of sharing cataloguing information, thus providing access to the collection more rapidly and decreasing cataloguing costs.... Although the classed catalogue has proved to be an efficient subject retrieval tool, it could not hold against the current trends.[55]

In Quebec, where the classified catalog enjoyed some popularity, large and small libraries have converted or are considering converting or closing their classified catalogs. Again, the reason is standardization: to bring, for the time being, research and academic libraries in line with Ontario libraries as members of UNICAT/TELECAT (a program of cooperative cataloging based on OCLC) with the addition of a bilingual (English and French) union file.

If we claim that subject indexing is equivalent to classification, then alphabetical subject catalogs will not alleviate defective classification. J.E. Daily has written: "One must assume that language, in its broadest sense, affects the subject indexing and that there is no distinct difference between classification, which is identified by its structure of notation, and the alphabetical list, however organized. Subject indexing is a classification process."[56] The *Encyclopédie*[57] is an alphabetical dictionary, but Diderot states that refer-

ences between words are the most important part of the work; the intent of the "renvois" is obviously classificatory.

The future of classification for information retrieval lies in the confrontation of economics and the intrinsic value of research and its application. Valuable advances have been made and successfully applied in the classification and subject indexing of science and technology. Unfortunately, the humanities and the social sciences have been poorly served, and deserve more investigation in order to provide meaningful subject access. Any new venture is costly, and the economics will weigh heavily in adopting or rejecting systems applicable to a particular library. This is why standardization, regardless of its worth, has gained so many supporters.

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